

CLAIMS

1. An induction heating coil comprising a coil portion being wound at a predetermined number of turns into a predetermined shape, with a coil wire being a conductive wire for coil, said coil wire being formed by covering the outer faces of stranded wires, obtained by bundling and twisting a plurality of wires of conductors covered with a first insulating material, with a second insulating material.

2. An induction heating coil in accordance with claim 1, wherein said coil wire is a multi-stranded wire obtained by twisting at least two stranded wires, each obtained by bundling and twisting a multiplicity of said wires, one or more times.

3. An induction heating coil in accordance with claim 1 or 2, wherein the diameter of said conductor is 0.1 mm or less.

4. An induction heating coil in accordance with claim 1 or 2, wherein said second insulating material is a fluorocarbon resin.

5. An induction heating coil in accordance

with claim 1 or 2, wherein said second insulating material has multiple layers having different melting points, and the melting point of the outermost insulation layer is made lower than the melting point of the inner insulation layer.

6. An induction heating coil production method comprising:

a step of forming a coil portion by winding a coil wire at a predetermined number of turns into a predetermined shape, said coil wire being formed by covering the outer faces of stranded wires, each obtained by bundling and twisting multiple wires whose conductors are covered with a first insulating material, with a second insulating material, and

a step of connecting terminals for external connection to the ends of said coil portion while electrical connection to said conductors is maintained.

7. An induction heating coil production method in accordance with claim 6, wherein said coil wire forms a multi-stranded wire by carrying out twisting at least two stranded wires, each obtained by bundling and twisting a multiplicity of said wires, one or more times.

8. An induction heating coil production method in accordance with claim 6, comprising a step of securely bonding the adjacent portions of said coil wire mutually, wherein said second insulating material has multiple insulation layers having different melting points, the outermost insulation layer constituting said second insulating material is formed of an insulation layer having a melting point lower than the melting point of the inner insulation layer, and said outermost insulation layer is fused by heating.

9. An induction heating coil production method in accordance with claim 6, comprising a bonding step wherein said second insulating material of said coil wire is fused by heating said coil portion having been wound to a predetermined temperature so that the adjacent portions of said second insulating material are mutually bonded and so that the shape of said coil portion is maintained after solidification.

10. An induction heating coil in accordance with claim 1 or 2, being formed by winding a coil wire obtained by bundling and twisting multiple wires having different sectional areas.

11. An induction heating coil in accordance with claim 10, wherein said coil wire has a multi-stranded wire structure obtained by further twisting multiple times a multiplicity of said stranded wires comprising a multiplicity of said wires having different sectional areas

12. An induction heating coil in accordance with claim 10, wherein said coil wire is formed by twisting, around the circumference of said wire having a first sectional area or said stranded wire comprising said wires having the first sectional area, said wires having a second sectional area different from the first sectional area or said stranded wires comprising said wires having the second sectional area.

13. An induction heating coil in accordance with claim 1, wherein the outer circumference of said coil wire having said wires or said stranded wires is provided with said second insulating material partly or wholly.

14. An induction heating coil in accordance with claim 1, wherein an upper-level stranded wire is formed by twisting said wires or said stranded wires,

at least the outer circumference of said upper-level stranded wire is provided with said second insulating material partly or wholly, and said stranded wires are further twisted to have a multi-stranded wire structure.

15. An induction heating coil in accordance with claim 13 or 14, wherein said second insulating material becomes a bonding insulating material having an adhesion function when subjected to predetermined heating processing.

16. An induction heating coil in accordance with claim 15, wherein said bonding insulating material contains a thermoplastic resin, and a portion of said second insulating material and another portion of said second insulating material adjacent to each other are fused and bonded by heating.

17. An induction heating coil in accordance with claim 15, wherein said bonding insulating material contains a non-cured or half-cured rubber or resin, and a portion of said second insulating material and another portion of said second insulating material adjacent to each other are bonded by heating.

18. An induction heating coil in accordance with claim 15, wherein said bonding insulating material contains woven cloth or nonwoven cloth immersed in a non-cured or half-cured rubber or thermoplastic resin, and a portion of said second insulating material and another portion of said second insulating material are bonded by heating.

19. An induction heating coil in accordance with claim 13 or 14, wherein said second insulating material is heat-shrinkable tape, and said heat-shrinkable tape is wound around said stranded wires or said coil wire and heated to secure said stranded wires or said coil wire.

20. An induction heating coil in accordance with claim 13 or 14, wherein an adhesion portion is provided on the outer circumference of said second insulating material, and adjacent portions of said second insulating material are bonded via this adhesion portion.

21. An induction heating coil in accordance with claim 13 or 14, wherein when the outer circumferences of said stranded wires or the outer circumference of said coil wire is provided with said

second insulating material, said stranded wires themselves or said coil wire itself is heated to reduce volatile components included in said stranded wires themselves or said coil wire itself, and then said second insulating material is provided.

22. An induction heating coil in accordance with claim 1, 2, 13 or 14, wherein said coil portion is configured so that the total volume of said conductors of said wires with respect to the total space volume thereof is not more than 50%.

23. An induction heating coil in accordance with claim 13 or 14, wherein wires of 0.1 mm or less in the diameter of said conductor are used for at least part of said stranded wires or said coil wire.

24. An induction heating coil in accordance with claim 1, 2, 13 or 14, wherein an object to be heated is induction heated by passing a high-frequency current of 40 to 100 kHz through said induction heating coil.

25. An induction heating coil in accordance with claim 1, 2, 13 or 14, wherein said coil wire is configured by mixing right stranded wires each

obtained by twisting a bundle of a multiplicity of said wires clockwise and left stranded wires each obtained by twisting a bundle of a multiplicity of said wires counterclockwise.

26. An induction heating coil in accordance with claim 25, wherein said coil wire is formed by further twisting one or more of said right stranded wire and one or more of said left stranded wire so as to have a multi-stranded wire structure.

27. An induction heating coil in accordance with claim 26, wherein said coil wire comprises said right stranded wires and said left stranded wires being equal in number and being twisted for at least one-stage twisting.

28. An induction heating coil in accordance with claim 26, wherein said coil wire comprises said right stranded wire and said left stranded wire, one for each, being twisted in advance for at least one-stage twisting.

29. An induction heating coil in accordance with claim 1, 2, 13 or 14, wherein two or more kinds of stranded wires formed by twisting bundles of said

wires or said stranded wires at pitches different mutually are further twisted to form a multi-stranded wire.

30. An induction heating coil in accordance with claim 29, wherein said coil wire is formed by bundling stranded wires, the ratio values of said mutually different pitches of which are values other than integers.

31. An induction heating coil in accordance with claim 1, 2, 13 or 14, wherein said coil wire formed by twisting said wires or said stranded wires at irregular pitches is wound.

32. An induction heating coil in accordance with claim 1, 2, 13 or 14, wherein said coil wire is formed of a mixture of a right-spiraled tube-shaped right spiral portion and a left-spiraled tube-shaped left spiral portion, each formed of a multiplicity of said wires or said stranded wires.

33. An induction heating coil in accordance with claim 32, wherein said coil wire comprises said right spiral portion and said left spiral portion, inside either one of said spiral portions, the other

spiral portion being provided close thereto.

34. An induction heating coil in accordance with claim 32, wherein said coil wire is configured such that the inside/outside positional relationship of said tube-shaped right spiral portion and left spiral portion is replaced alternately each time said wires or said stranded wires intersect.

35. An induction heating coil in accordance with claim 32, wherein said coil wire is configured such that the inside/outside positional relationship of said tube-shaped right spiral portion and left spiral portion is replaced at each predetermined length.

36. An induction heating coil wherein said coil wire set forth in any one of claims 32 to 35 is pressurized into a flat shape and wound.

37. An induction heating coil in accordance with claim 1, 2, 13 or 14, comprising terminal portions for external connection secured to the ends of said coil portion while electrical connection to said conductors is maintained by carrying out heat generation using Joule heat generated by current

flowing and by pressurizing the ends of said coil portion at the same time to fuse said first insulating material and said second insulating material and to pressure-bond said ends to said conductors.

38. An induction heating coil in accordance with claim 37, further comprising a coil holding member for holding said coil portion, said terminal portion being secured to said coil holding member and having a threaded hole.

39. An induction heating coil in accordance with claim 38, further comprising a coil holding member for holding said coil portion, said terminal portion being secured to said coil holding member and having a female thread portion equipped with a cylindrical protruding portion provided with a thread on the inner face thereof, the movement of said terminal portions in the horizontal direction being restricted by said female thread portion and said coil holding member when installed on said coil holding member.

40. An induction heating coil in accordance with claim 37, further comprising a coil holding member for holding said coil portion and said terminal

portions, said terminal portion having a connection portion for electrically connecting said conductors by simultaneously heating and pressurizing the end of said coil portion, a coil wire holding portion extended to said connection portion and a bending portion extended nonlinearly to said coil wire holding portion, said bending portion having a female thread portion or a hole, and said coil wire at the end of said coil portion being lead out from said connection portion in a direction substantially identical to that of said coil wire holding portion.

41. An induction heating coil production method in accordance with any one of claims 6 to 8, comprising:

a step of connecting terminals for external connection to the ends of said coil portion while electrical connection to said conductors is maintained by carrying out heat generation using Joule heat generated by current flowing and by pressurizing the ends of the coil portion at the same time to fuse said first insulating material and said second insulating material and to pressure-bond said ends with said conductors.

42. An induction heating coil production

method in accordance with claim 40, comprising a step of leading out said coil wire at the end of said coil from said connection portion in a direction substantially identical to that of said coil wire holding portion, said terminal having a connection portion for electrically connecting said conductors by simultaneously heating and pressurizing the end of said coil portion, a coil wire holding portion extended to said connection portion and a bending portion extended nonlinearly to said coil wire holding portion, and said bending portion having a female thread portion or a hole.